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ECOSYSTEM MANAGEMENT

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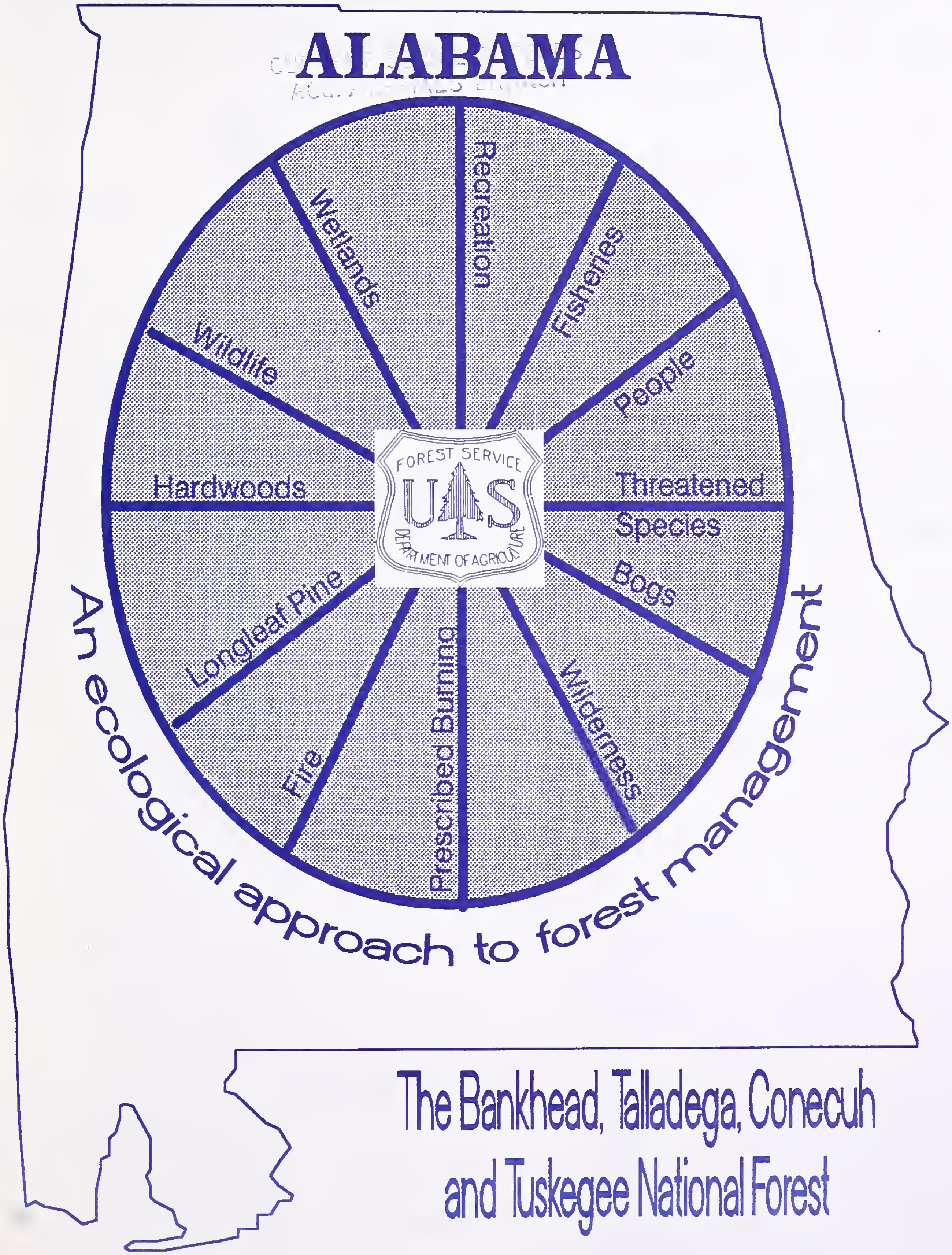

An ecological approach to forest management

The Bankhead, Talladega, Conecuh
and Tuskegee National Forest

Table of Contents

Map of the National Forests in Alabama 3
Ecosystem Management--What's That? 4
Riparian Areas 6
Tuskegee Evaluated for Demonstration Forest 7
Conecuh Reclaims Sandhills Ecosystem 8
Nellie Pond: Home to Unique Animals 9
Sipsey Wilderness Under Investigation 10
Universities Provide Botanical Surveys 11
Native Grasses Return to Talladega 11
Native Ecosystems Returning to Oakmulgee 12
Hardwood Ecosystem Management 13
New Strategy Recovers Lost Conecuh Ecosystems 14
Pine Straw Harvesting Under Investigation 15
Recovery Underway for Talladega Longleaf Ecosystem 16

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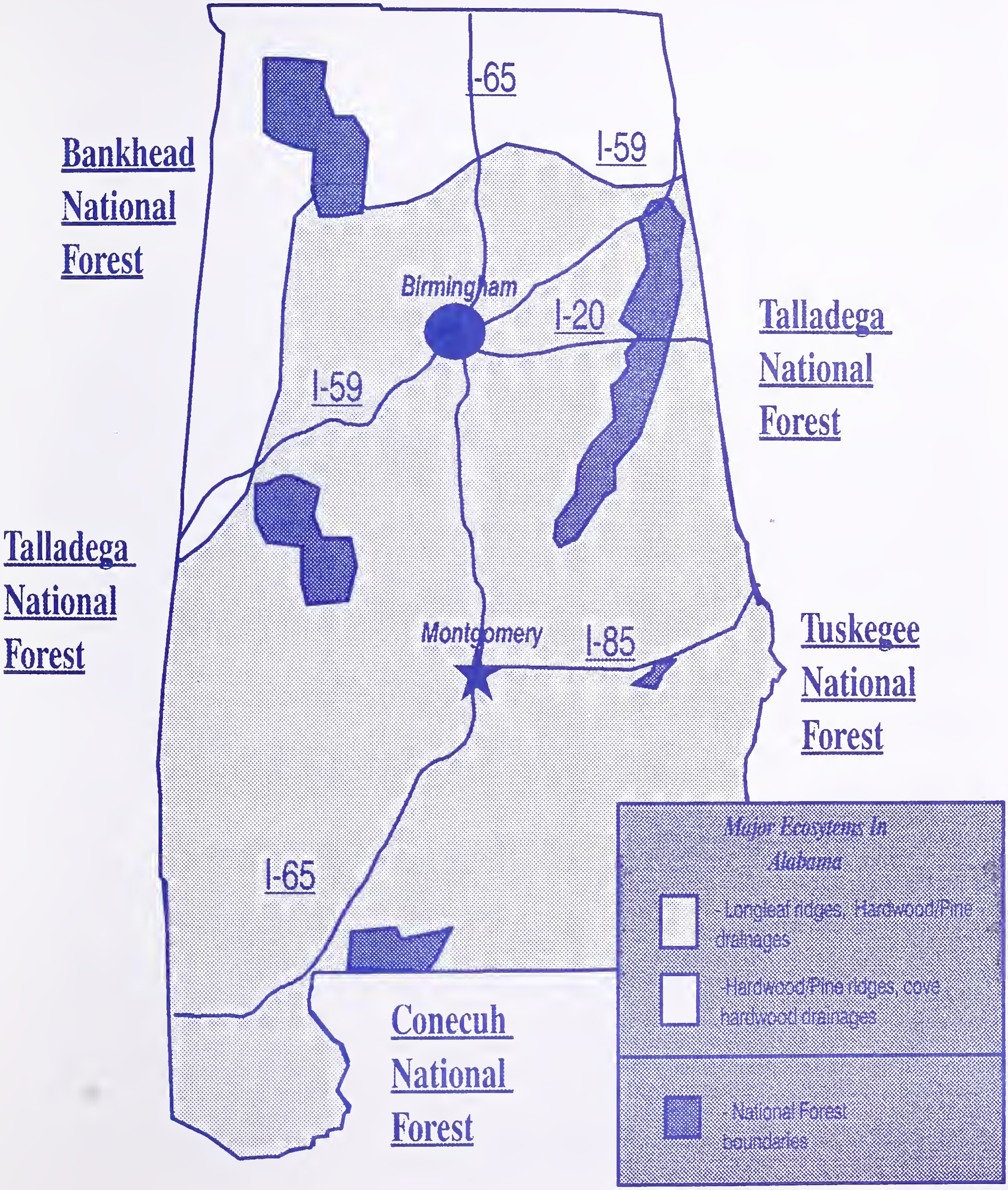
Forestry Report R8-FR 42 **October 1993**

The National Forests in Alabama



"Ecosystem Management --- What's That?"

by National Forests in Alabama Forest Supervisor John Yancy

This is the typical response of forest visitors when a Forest Service employee says, "we are managing your forest under the Ecosystem Management Concept."

One of the best ways to understand Ecosystem Management is to look at a wagon wheel . Each spoke in the wheel is necessary for the wheel to run effeciently. The same concept takes place in the ecosystem of a forest.

Before the USDA Forest Service acquired about 680,000 acres of the four national forests in Alabama, most of your national forest lands in Alabama were private farms and timberland. Most of it was cut at least once, and some of it had been deforested twice. However, after more than 50 years of management, you can witness the return of a productive forest through scientific management practices.

The Forest Service has gone through many changes during the last six decades. Today, we turn over another leaf in the epic of increasing our knowledge of natural resource management with ecosystem management.

The Ecosystem Management Concept is now being intergrated into the management of the National Forests in Alabama.

Yes, change has started taking place. You will see a more balanced approach to timber, wildlife, recreation, water quality, wilderness, and other types of management you've seen in the past. There will be some changes in the way we remove trees to help provide wood products for the United States. There will be some changes in wildlife management; the recreation program will be increased, and more emphasis will be placed on keeping the National Forests in Alabama as the source of the state's cleanest water. These changes will become obvious in the next few years, but for now we are in the planning and evaluating stage. We are beginning to implement ecosystem management in all aspects of forest, recreation, wilderness, and other land management plans in Alabama. The results will evolve into a more effective way to manage public lands.

John H. Yancy, Forest Supervisor

Yes, change has started taking place. You will see a more balanced approach to timber, wildlife, recreation, water quality, wilderness, and other types of management than you've seen in the past.

However, so you will know more about what is happening, let me briefly explain what we are doing to manage the native ecosystems in Alabama.

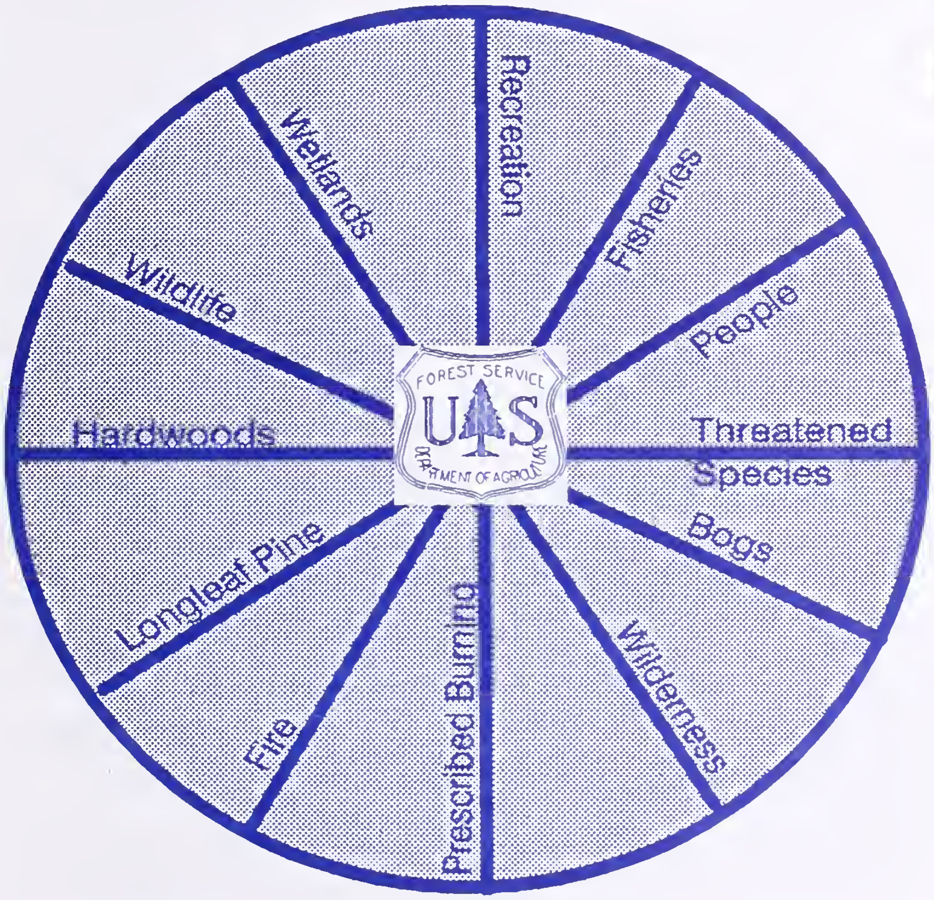
The four national forests in Alabama have some unique and very productive ecosytems. On the Talladega, Tuskegee, Conecuh and a small portion of the Bankhead National Forests, you will find the longleaf ecosystem. This occurs on the ridges. It can be identified by looking for the longleaf pine tree and a mixture of blackjack oak and some smaller shrubs. It also is home to the endangered red-cockaded woodpecker, and many species of more popular wildlife.

Prior to the settlement of the South by Europeans, African-Americans, Hispanics, Asian-Amerians and others, the longleaf ecosystem covered about 60 million acres of the coastal plains and piedmont areas of the South.

Today, this ecosystem is holding on in about 4 million acres. The decline is attributed to urban expansion, farming, and increased emphasis placed on replanting other pine species that are faster growing and produce quicker profits.

It has been found that the longleaf ecosystem is dependent upon fire. Before the 1900's, wildlfires would periodically burn along these ridges and, as they got closer to the creeks, the fires would go out. Today, the Forest Service is working hard to mimic the natural fires of past centuries by using prescribed burning. This is a very important tool to reclaim and sustain our declining longleaf ecosystems.

Forests also have the popular hardwood ecosystems along the drainages and in the areas that have deep and more productive soils. Some of the most visible hardwood drainages can be found on the three districts of the Talladega and Bankhead National Forests. These ecosystems are the producers of winter food for many wildlife species, help protect riparian zones, and are a very important component to ecosystem managment in Alabama.



In addition, we are expanding our recreation program. Recreation areas are being upgraded, hiking trails expanded, and more emphasis is being placed on interpreting our natural resource for YOU.

However, this too is to be evaluated to make sure these activities are not harmful to the recovery or sustaining of a particular ecosystem.

In accomplishing this transition, we are working with a group of colleges to bring together some of the best minds in the business. Also, we are evaluating a proposal to make the Tuskegee National Forest the state's premier demonstration forest. This proposal, if approved, will make the Tuskegee a showplace for research, extension, and education.

Our overall goal now is to evaluate the effects of activities such as recreation, timber and wildlife management, forest recovery, and other management activities on the State's natural ecosystems. In turn, it will enable us to develop more effective ways to continue supplying the public with all kinds of forest products, and not harm the recovery and health of the ecosystems.

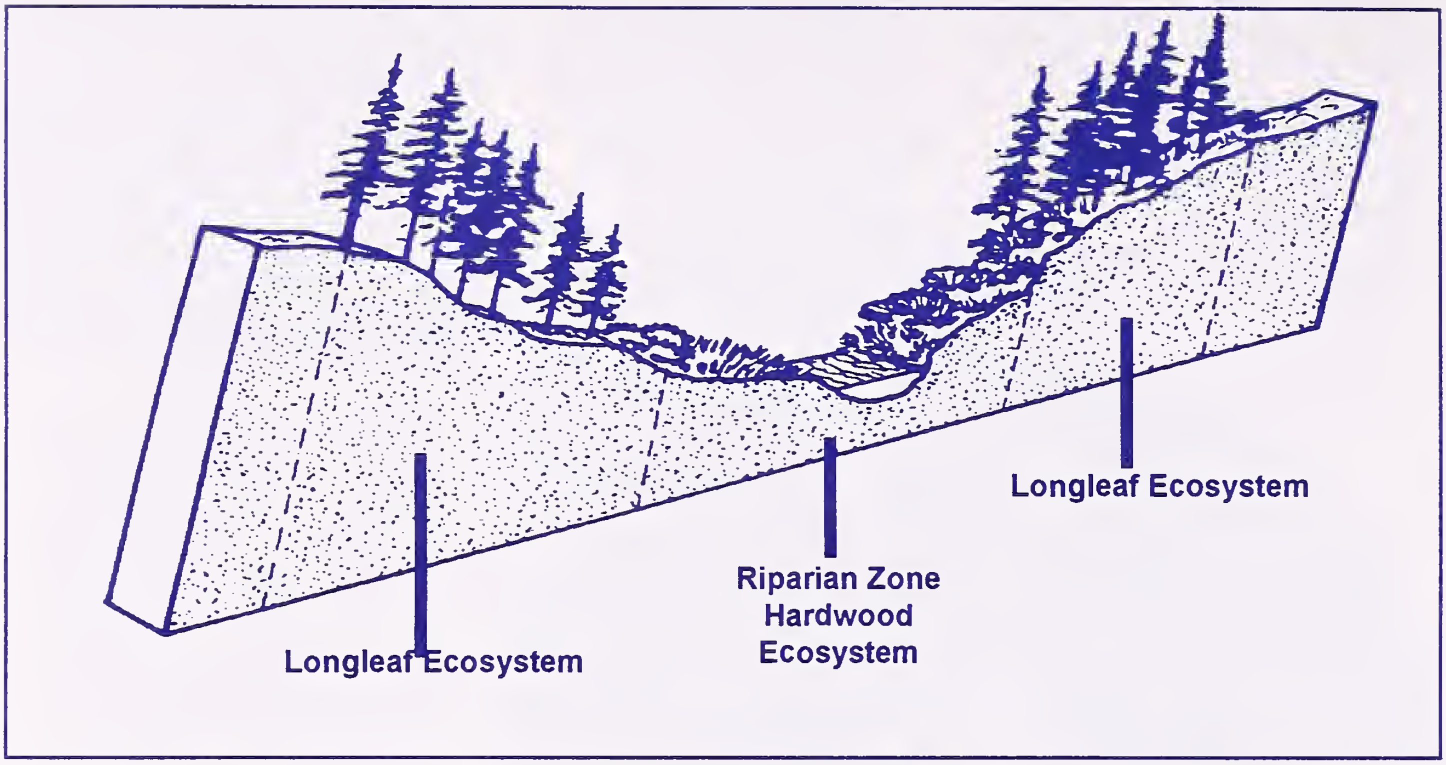
> Our work has just begun to make sure that we—the Forest Service and the public—work together and ensure these wheels keep rolling.

As you can see, ecosystem management is complicated. Each ecosystem resembles a wheel. If this wheel has missing spokes, they must be fixed so the ecosystem will run in an effecient manner. If too many spokes are missing, an overhaul is necessary. Our job is to make that determination and move forward in supplying the public's expectations in ways that do not make these wheels break down.

With the use of a staff of natural resource professionals, we have embarked on an aggressive mission to ensure our ecosystems are reclaimed and are more productive tomorrow than they are today. This will require research, monitoring, public participation, and time.

Our work has just begun to make sure that we--the Forest Service and the public--work together and ensure these wheels keep rolling.

Riparian Areas:
An Ecosystem that Protects Water Quality



Clean water, the recharge of nutrients, and unique animal species all have one thing in common -- they depend on a protected riparian zone. Riparian zones are strips of land that separate the upland ecosystems and those aquatic habitats in streams and lakes.

The National Forest in Alabama has developed a "Riparian Area and Wetland Management Strategy." This plan outlines the steps we will use for managing riparian areas.

Forest Service personnel of the four national forests are now inventorying and identifying the riparian areas. This involves identifying the soils, plants, and the hydrology or water system that creates the riparian ecosystem.

The second important step is to identify the dependent resources associated with riparian ecosystems. This could be endangered species, sensitive plants, flood retention, and water quality.

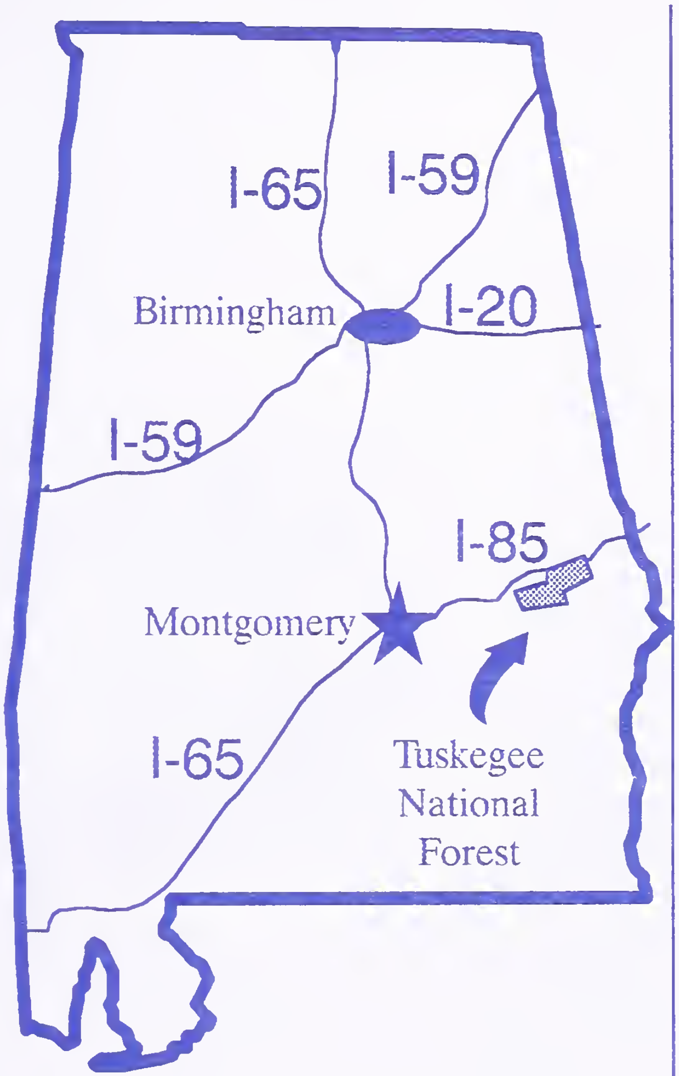
The identification of dependent resources in riparian ecosystems will be coordinated between the forest aquatic biologist, soil scientist, hydrologist and botanist. In addition, cooperation with private organizations and universities are ongoing. An example of this cooperation is a wetland study by the University of Alabama's Biology Department on the Oakmulgee District of the Talladega National Forest. This study is gathering information on hydrology, aquatic plants and animals, and the filtering capacity of the wetland.

Riparian Areas seperate the uplands from the aquatic ecosystems.

The last and most important step is to develop a management plan with objectives, while recognizing the dependent resources and unique values of riparian ecosystems for wildlife, timber, recreation, visual and cultural resources.

The results of these inventories will enable the Forest Service to protect, enhance and monitor those riparian areas that have the potential of being affected by management practices.

Tuskegee National Forest Evaluated for Demonstration Forest



The 11,000-acre Tuskegee National Forest, located in Macon County, is being considered for being Alabama 's first demonstration national forest. If approved, Ecosystem Management projects in forestry, recreation, and wildlife management would be showcased to provide the public with examples of how ecosystem management takes place.

"This is a bold step," said John Yancy, forest supervisor for the National Forests in Alabama. "We are making the evaluation in cooperation with the Alabama Consortium for Forestry, Education, and Research." The Alabama Consortium consists of scientists from Auburn, Tuskegee and Alabama A&M universities, the National Forests in Alabama, and the Southern Forest Experiment Station.

"The objective is to see if it would be beneficial to manage the Tuskegee National Forest under the Ecosystem Management concept," Yancy said. Under this new concept, clear-cutting would be reduced and other methods of timber harvests would be evaluated for timber management. As for recreation and wildlife, these resources would be managed so they can be enhanced, while still protecting the area's unique cultural resources, and plant and animal life.

Tuskegee is home to the 200-acre Tsinia Wildlife Viewing Area, Bartram National Recreation Trail, Taska Recreation Area, a shooting range and fishing ponds. This area was once badly eroded farm lands the Forest Service has restored to productive forests for recreation, wildlife, and timber production.

"With the close proximity of two major universities and a major interstate, Tuskegee could make significant contributions in providing a better understanding to the public of what Ecosystem Management is," Yancy said.

Yancy further noted that "The Tuskegee National Forest could be managed to provide the public with examples of how forestry, wildlife management, and recreation could coexist and benefit each other. It could be a model for the state and an important educational tool for visitors and private landowners seeking new and innovative ways to manage their forests."

> "The Tuskegee National Forest could be managed to provide the public with examples of how forestry, wildlife management, and recreation could coexist with Ecosystem Management."

Conecuh Reclaims Sandhills Ecosystem

The major ecosystem of the 83,000-acre Conecuh National Forest is longleaf pine ecosystem in association with the wiregrass/bluestem understory.

Historically, fire has played a major role in maintaining this ecosystem. Because of the reduction of this ecosystem throughout the South, many of the plants and animals dependent on this unique ecosystem have declined in the last century.

The Conecuh National Forest has at least 10 species of plants and animals listed as threatened, endangered, or proposed for listing. These mostly occur in the fire-dependent longleaf pine ecosystem.

The gopher tortoise, one of the area's significant indicator species of this ecosystem, requires loose sands to construct its burrows. Throughout its native range, much of this habitat has been lost to development.

Although this animal is not yet considered endangered on the Conecuh, there are more than 350 species known to utilize its burrows. Some of the more well-known inhabitants are the eastern indigo snake, eastern diamondback rattlesnake, the Florida pine snake, and the dusky gopher frog, which are expected to be listed in the next 2 years.

Research has shown that foraging for the tortoise is a major limiting factor of its population. This is why we are looking at ways to enhance the areas where they eat. It is theorized that if we increase the populations of the gopher tortoise, the associated species will also increase.

About 30 years ago, the Forest Service began converting the longleaf pine forest to a faster-growing slash pine forest. This was done because the seedling survival was much higher in slash pine than longleaf.

After being planted, the slash pine grew fast and shaded the forest floor, which decreased the growth of a young longleaf forest. Longleaf normally grows best in more open areas, when it is young.

The slash pine plantings are now showing signs of stagnation. Also, the slash pine does not have a tap root like the longleaf pine, so on the sandhills it has a more difficult time reaching adequate soil moisture. In turn, this stresses the tree and makes it more vulnerable to disease.

About 5 years ago, the Forest Service realized this was not proper ecosystem management and is now looking at many areas where slash pines were planted to be converted back to longleaf pine. The change to ecosystem management has been encouraged, applauded, and supported by the environmental community as evidenced by an unprecedented exchange of ideas, information, and cooperation on several recent projects.

Currently, the Conecuh plans to convert most of the slash pine forests to longleaf pine when they get 35 to 40 years old. At this age, the slash pines are expected to produce a merchantable product. In areas where the slash pines have poorer soils, they will be converted to longleaf in the next decade.

Nellie Pond: Home to Unique Animals

Nellie Pond, located in the Sandhills Ecosystem of the Conecuh National Forest , is an oasis for some of the State's most unique species. Some of these animals are now being monitored and used as indicators of how well this ecosystem is recoverying.

In 1989, Mark Bailey, of Auburn University, began studying the dusky gopher frog on the Conecuh.

He visited or located active or known duskey gopher frog breeding ponds on the Conecuh and monitored them for two breeding seasons.

The frog breeds in ponds that normally dry up annually or during droughts. It was concluded that this normal drying prevents fish from occupying the ponds and eliminates natural predation on the frog eggs and tadpoles.

After the spring breeding season, the frog moves to the sandy ridges of the Sandhills Ecosystem. In order for this frog to survive, it must be able to find refuges to escape the heat of summer. The refuges they prefer are the burrows of the gopher tortoise. These are often located near the fishless ponds.

The gopher tortoise, another significant indicator species of this ecosystem, requires loose sands to construct its burrows. Throughout its native range, much of this habitat has been lost to development.

Although this animal is not yet considered endangered on the Conecuh, there are more than 350 species known to utilize its burrows. Some of the more well-known inhabitants are the eastern indigo snake, eastern diamondback rattlesnake, the Florida pine snake, and the dusky gopher frog, which are expected to be listed in the next 2 years.

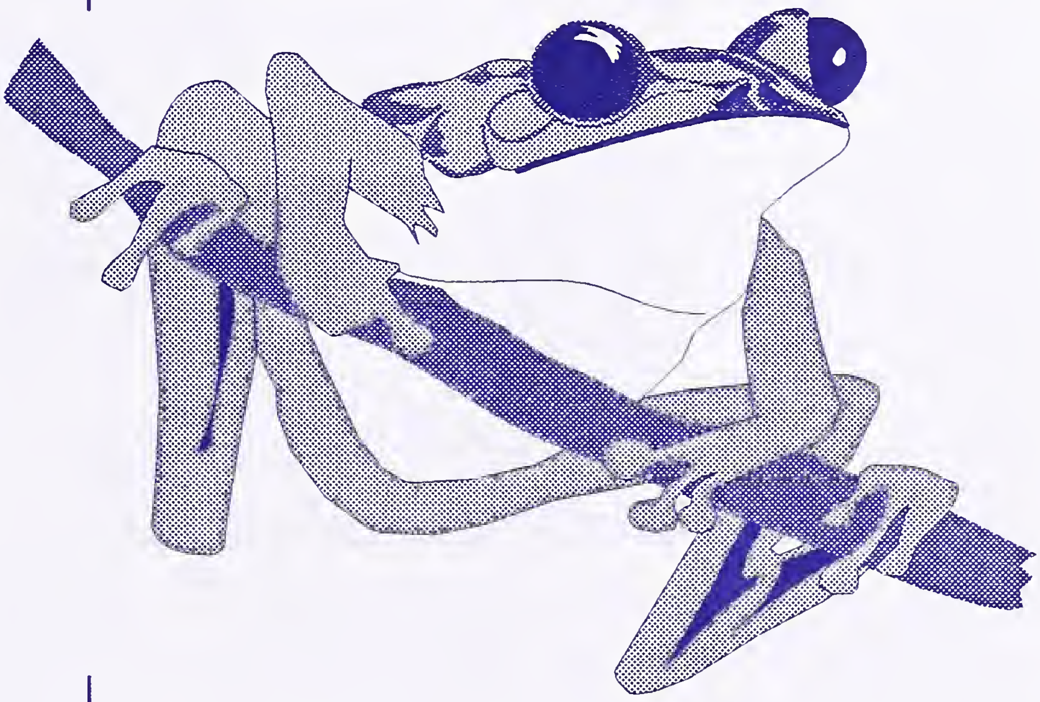
As for Nellie Pond, it is one of three study ponds located on the Conecuh. Two of them were stocked by anglers wanting to enhance the ponds' fish populations.

A few years ago, the Forest Service began evaluating the area for a timber sale and also began working with Auburn University to monitor the changes in the area's gopher tortoise population.

Also, the Forest Service designed plans to rid Nellie Pond of the fish that were preying on the frog's eggs and tadpoles. In 1992, the Forest Service found most of the environmental community in favor of the project. However, most local residents, who had stocked this pond and subsequently fished it, violently opposed the project.

In August 1992, the Forest Service held a public meeting to explain the proposed project to the public. At this meeting, several environmental experts explained the inter-relationships of the communities involved. The distict ranger made an appeal to the local community for its support.

The public was supportive of the project and the Forest Service was able to reach agreement to move ahead. The ponds were drained and the fish eliminated. The fish that could be caught from the ponds were relocated or utilized by the public. Projects are now underway in and around Nellie Pond to evaluate the recovery of the area's unique animal life as an indicator of the ecosystem's recovery.



Sipsey Wilderness Plant Communities Under Investigation

Alabama A&M and the Bankhead National Forest have joined together to examine some of the treasures of the forest's 26,000-acre Sipsey Wilderness. This study will help determine what plant communities exist and what changes have occurred.

The benefit of this project to the forest's air management program is clear. If the periodic monitoring to follow this survey reveals plant community changes that cannot be explained by succession or insects and disease, then air quality may be the cause. Other benefits will be wilderness, botanical, and threatened and endangered species programs.

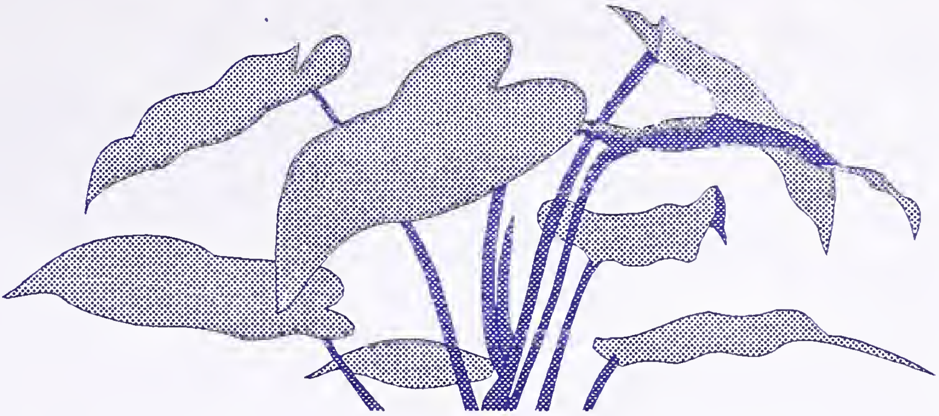
The 26,000 acres comprising today's Sipsey Wilderness were effectively "released" from general forest management about 20 years ago. Except for some recreation, wilderness and soils projects, the area has not been inventoried in 20 years. Forest Service officials are curious as to what ecological changes have taken place.

Even though there is no timber management in the wilderness, the forest's timber management program will benefit indirectly from the project. For the many rounds of land management planning the forest will face in the future, questions about old growth, diversity, and even-aged management will arise. What happens to previously managed stands as they grow into "old growth"? How long does it take for an area to recover 70%, 90%, 95% or 100% of its original diversity? Do the areas deep within a wilderness recover faster due to their distance from invasive species?

In the Sipsey Wilderness, we have a large area that's running 20 years ahead of the rest of the forest to study for answers to those questions. In addition, since Sipsey is a large wilderness, there is an opportunity to see if the rate of diversity recovery varies with distance from nearby intensively managed areas.

Like the timber program, the forest's wildlife program will also benefit indirectly from this project. As previously managed areas proceed towards old growth, what happens to wildlife habitat and mast or forage production? In the Sipsey, we already have 26,000 acres ripe for the first examination. To answer these questions, we do not have to set aside additional research acreage. We do not have to wait for 20 years of succession to pass. In order to answer some of these important questions, all we need to examine is a resource already at hand.

Universities Provide Botanical Surveys



Two Alabama universities have joined forces with the Talladega National Forest to provide the Forest Service with botanical surveys. These surveys will assist land management professionals in making decisions about future management on this forest.

On the Talladega Ranger District, Mark Ballard, a Jacksonville State University graduate student is working under the direction of Dr. David Whetstone to document the flora of the Talladega Ranger District by conducting field surveys on the district. He will provide information on sensitive, rare, threatened and endangered plant species. This information will help the Forest Service as they manage and protect these species to ensure that our natural heritage is preserved for future generations.

Dr. Whetstone also has graduate student, Francine Hutchinson, working on the Shoal Creek District, near Dugger Mountain. She will be documenting the flora of the area, which is being considered for wilderness designation.

Alvin Diamond of Troy State University is surveying the Oakmulgee Ranger District for the endangered Alabama canebrake pitcher plant. This very rare carnivorous plant is known to occur along the fall-line of central Alabama in Autauga, Chilton, and Elmore counties. He will provide the Forest Service with information on other sensitive, rare, threatened, and endangered plant species that he encounters while conducting his survey.

Native Grasses Return to the Talladega

Native grasses are being used now to reclaim areas for watershed improvements and recover roads used for removing trees on the Shoal Creek District of the Talladega National Forest.

The reason for this is that native grasses requires little maintenance or fertilization, unlike many other seed mixtures for 1-2 years to ensure success. They are also a natural component of the ecosystem and native to the area.

In 1989, the district planted a variety of native grass mixtures in 17 areas. They were evaluated for longevity and their ability to sustain drought and wet weather.

It was found that big bluestem, little bluestem, and switchgrass were the best. In 1990, multiple field tests on an array of areas were made using "native grasses" of about six species. The ones we now use were found to be the most successful.

Since the original test year and after 2-3 years of monitoring, the district has opted to only use native grasses on old roads, skid trails, and logging decks. However, in some instances the district is keeping a fescue component in the prescribed seed mix.

In 1993, the seed mixture was used on about 20 acres of roads, skid trails, and logging decks. It is now a part of our normal ecosystem recovery program on the Talladega.

Native Ecosystems Returning to Oakmulgee

What visitors now witness on the Oakmulgee District of the Talladega National Forest is far different from the natural ecosystem that existed prior to 1900. However, plans are underway to recover this forest to its original condition.

The forest's original ecosystem, based on early journals, consisted of uplands that were primarily longleaf pine, low brush and shrubs with a small amount of upland hardwoods, and an occasional loblolly pine. The drainages were hardwood with a small amount of loblolly pine. Natural fires maintained this ecosystem through time, and wildlife dependent on these natural ecosystems were abundant.

Eventually, this ecosystem changed. Farming and logging of the entire forest altered this forest's ecosystems. The loblolly pine became a much more predominate tree on the ridges and in the drainages.

In addition, the Forest Service removed fire from the ecosystem and until 1984 work centered on changing the ecosytem from one that had native longleaf pines and hardwoods to one with more of a loblolly pine environment. The idea was to grow loblolly pine on a short rotation in order to maximize the production of timber.

Returning the Oakmulgee to its natural condition is the major emphasis on this western part of the Talladega Naitonal Forest.

By 1984, it became apparent that we were losing some old -growth species. That year was when the Forest Service began working to protect and enhance the endangered red-cockaded woodpecker. In 1984, the district made a decision to begin an ecosystem restoration system to eventually return the 100,000 acres of upland ridges to the original longleaf pine ecosystem.

This unwritten strategy included harvesting nothing but loblolly pine trees from areas where the longleaf ecosystem once flourished. This was done by hand-planting longleaf pine. By doing so, Oakmulgee became the South's first district to successfully hand plant longleaf on a large scale.

Since 1984, the Oakmulgee has converted 10,000 acres of loblolly to longleaf. The district still has 50,000 acres of loblolly. Some 35,000 acres of this is the natural forest that seeded in during the 1920's following the abandoning of farms and large-scale logging. These stands are now dying, leaving as upland scrub hardwood timber type.

The district is recovering about 600 acres per year, which is not as fast as some people would want, but it is all that can be accomplished with the budget restraints.

The long range goal of the restoration strategy is to remove the loblolly pine and keep the longleaf for potential nesting trees for the red-cockaded woodpecker. These areas will be managed until they reach 100-120 years old.

Final harvesting and regeneration will be accomplished using the shelterwood method. This plan, if carried out, should allow the Oakmulgee to become a producer of large timber volumes. Meanwhile, the plan will be effective at assisting in the recovery of the red-cockaded woodpecker, in addition to providing quality habitat for other wildlife species.

Hardwood Ecosystem: Small Acorns Grow Mighty Oaks

On the Shoal Creek District of the Talladega National Forest, work is underway to ensure oak regeneration is sustained and not lost.

The oak enhancement work takes place in hardwood ecosystems where upland oak mixtures are sought. The areas selected are in places where large and advanced reproduction is lacking or absent. The goal is to establish levels of large, advanced regeneration of oaks (multiple species) prior to any harvest to ensure the moderately light- tolerant oaks will be a significant part of the new forest.

The primary question is "how long does it take to go from no advanced regeneration to a level that will ensure oak in the newly regenerated forest?"

Many areas lack the desired oak level because a three-layered forest prohibits oak seedling survival after germination. This problem is the result of many mid and understory trees that are shade tolerant; they out -compete the young hardwoods.

By using a selective amount of herbicide, the trees up to 25 feet and the small shrubs are eliminated to allow enough filtered sunlight to reach the "new understory" where oaks could now go from a seedling sprout on to a sapling. This could take anywhere from 3 to 10 years, depending on the amount of oak currently existing and level of mid and understory competition.

It has been found that this type of work is critical to ensure the success and perpetuation of upland oak species in the forest where it is vital to sustain the natural hadwood ecosystem.

New Management Strategy Helps Recover Lost Ecosystems on the Conecuh

The Conecuh National Forest is an island of historic ecosystems, which have thrived on fire and lightning- producing storms. These ecosystems changed when man cut the original forests, fire was controlled, and we grew a new forest with tree species that wouldn't sustain the natural ecosystem. Today, professional land managers are working to reclaim the ecosystems of the Conecuh, its populations of endangered species, natural bogs, and the unique Sandhills Ecosystem.

Methods to reclaim the Conecuh's natural bogs, red-cockaded woodpecker population and its unique Sandhills Ecosystem often overlap, but they complement each other.

Because of past deforestation, farming, and controlling natural fires, the health of Conecuh's ecosystems was placed in jeopardy. These problems are still playing a role in the area, as evidenced by the recent listing of some of the area's sensitive and endangered species.

For example, the red-cockaded woodpecker requires old, live, longleaf pine trees for nesting.

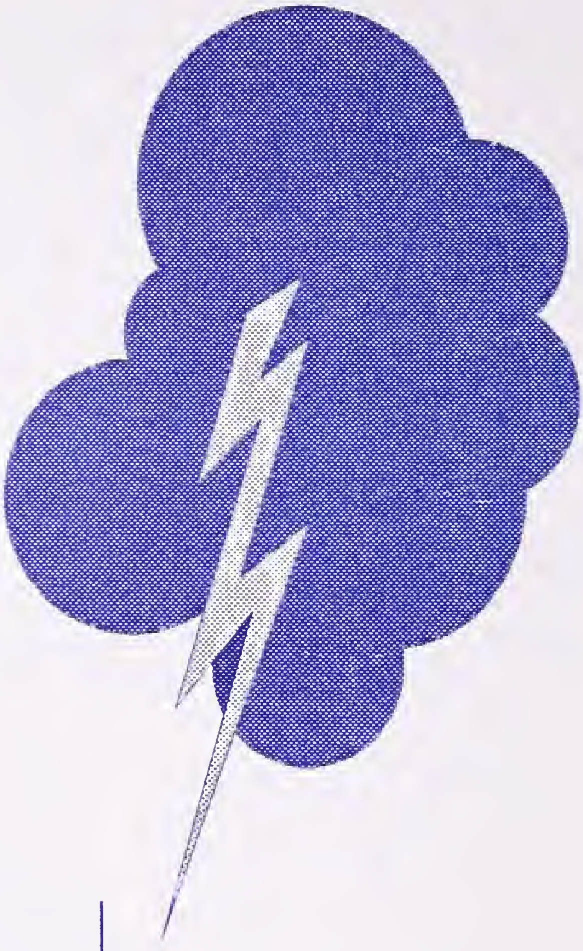
The problem is that most of the Conecuh was clear-cut in the 1930's. It was reforested with slash pine. This reduced the number of nesting trees for the endangered woodpecker.

However, we are now reclaiming the areas where slash pine was planted by preplacing it with native longleaf. This is being done to re-establish the historical longleaf ecosystem. If slash pine had been replanted, the problem would have continued, the ecosytem would be out of balance and nesting trees for the red-cockaded woopecker reduced even further.

However, the Conecuh is answering the challenge by continuing to:

- Restore the longleaf ecosystem.
- Prescribed-burning to mimic natural fires of the past.
- Install nest-boxes inside trees for the red-cockaded woodpecker.
- Relocate woodpeckers to increase the population.
- Eliminate trees that compete with those needed to sustain the red-cockaded woodpecker population.

And now, the Conecuh has began reclaiming some the the area's unique bog ecosystems by inventorying the forest and then control burning the area in the summer to mimic lightning fires of the past. The fires help reduce the encroachment of hardwoods and small shrubs into the bogs, which can eventually alter the plant community and ecosystem.



Pine Straw Harvesting Under Investigation

More people are looking to some national forests as the source for pine needles in landscaping and other home projects. However, some people are concerned that the collection of pine needles from the forest floor can affect the long-term productivity of the vanishing longleaf forests of the South.

To evaluate this, a 5-year research project is underway on the Conecuh National Forest to study the effects of pine straw raking on the long-term productivity of longleaf pine forests.

The research area has six plots about one-half acre each. Three will be raked annually and the other three will remain unraked. Each March, the three test plots will be raked. Prior to raking, five samples of pine straw are taken from each plot and sent to the Southeastern Forest Experiment Station for nutritional evaluation. After raking, another set of samples of residual pine straw will be taken.

In September, October, and November, the litter traps will be emptied and the oven-dry weights will be sent to the Southeastern Forest Experiment Station.

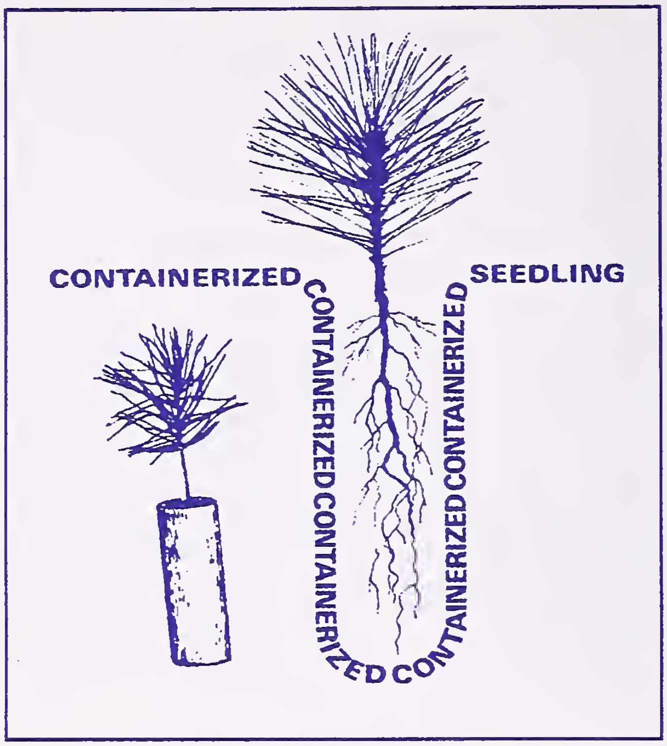
The first raking of straw produced 75 bales. Oven-dry weights of the samples dropped by about 90 percent after the first year of sampling. This study will determine if there is significant difference in nutrients available and whether this may affect the long-term productivity of the longleaf pine.

Longleaf Pine Needles

Needles are 10 to 18 inches long

Three needles per bundle

Recovery Underway for Talladega Longleaf Ecosystem



Although the longleaf pine ecosystem was once very common in the South Atlantic Gulf Coastal Plain, it has been reduced to about 4 million acres.

Historically occurring within 150 miles of coastal elevations of less than 500 feet on dry and sandy soils, the original virgin longleaf forest covered 60 million acres.

Uncharacteristically, the longleaf pine ecosystem is found in the piedmont and mountains of the Talladega National Forest. This ecosystem occurs on dry, rocky ridges at elevations between 600 feet and 1,900 feet, probably the only area that has natural longleaf stands occurring at such elevations.

Most of this is found on the Talladega Ranger District on the Talladega National Forest, where about 28,000 acres are managed for the longleaf pine ecosystem and managed for timber and wildlife. Plans are to convert about 19,000 acres to this ecosystem.

Longleaf pine has several unique advantages, which include:

--High-quality timber.
--Fire resistant.
--Resistant to southern pine beetle attack.
--Resistant to fusiform rust.
--Long-lived species.
--Preferred nesting habitat for the endangered red-cockaded woodpecker.
--Well adapted to dry, rocky, infertile sites.

This species also has several disadvantages:

--Poor survival of hand-planted seedlings.
--Must have mineral soil seedbed for seed germination.
--Seedlings will not tolerate hardwood competition.
--Slow initial height growth (3 to 6 years).
--Requires prescribed fire to to control hardwood competition.

However, in the last 20 years, two things have happened to greatly enhance the recovery of this ecosystem. One is the improved method to naturally regenerate this ecosystem through fire and leaving selected trees. Another is the development of containerized seedlings that produce excellent results.

Forest Service research developed a shelterwood regeneration system using natural seed for the re-establishment of the longleaf ecosystem. Under this system, 20 to 30 longleaf seed trees per acre are left after the others are harvested. Hardwood trees and brush are treated with prescribed fire and herbicide. Seed crops are monitored, burned and treated by machinery. This will expose the soil needed for seed germination.

After the longleaf seedlings become established, the seed trees are removed, allowing the new ecosystem to develop faster.

The development of containerized seedlings permits the regeneration of areas that do not have enough seed trees for natural regeneration. The root mass is not disturbed at the time of planting.

Containerized seedlings do not have to be dormant, since the root system is not disturbed. This permits planting in the early fall after rainfall moistens the ground. Seedlings begin growth during the winter and early spring. Containerized planting has increased survival from 20 to 50 percent, using bare root seedlings, to 80 to 100 percent for containerized planting.

Successful regeneration and an increased prescribed burning program will help restore the longleaf ecosystem. Lengthened rotations will provide habitat for the recovery of the red-cockaded woodpecker.